

Counting Down to the Centennial of Flight

Over 100 years ago, two visionary young men embarked on an adventure that would blaze a trail to the stars. In 2003 the world will celebrate the centennial of the Wright brothers' first free, controlled, and sustained flights in a power-driven, heavier-than-air machine that occurred at Kitty Hawk, North Carolina, but the brothers' compelling story actually began in Dayton, Ohio, in 1899. In the spring of that year Wilbur and Orville Wright resolved to actively pursue the possibility of human flight.

As we draw closer to 2003, hundredth anniversaries of noteworthy steps Wilbur and Orville took in their quest for flight will occur. These events were essential to the Wright brothers' invention of the airplane, for the Wrights' successful flights in 1903 were the culmination of their earlier work. As the brothers' invention is celebrated in 2003, the entirety of their achievements and these other milestones should be remembered.

May 30, 1899. In his first documented step in the pursuit of human flight, Wilbur Wright wrote the Smithsonian Institution requesting all

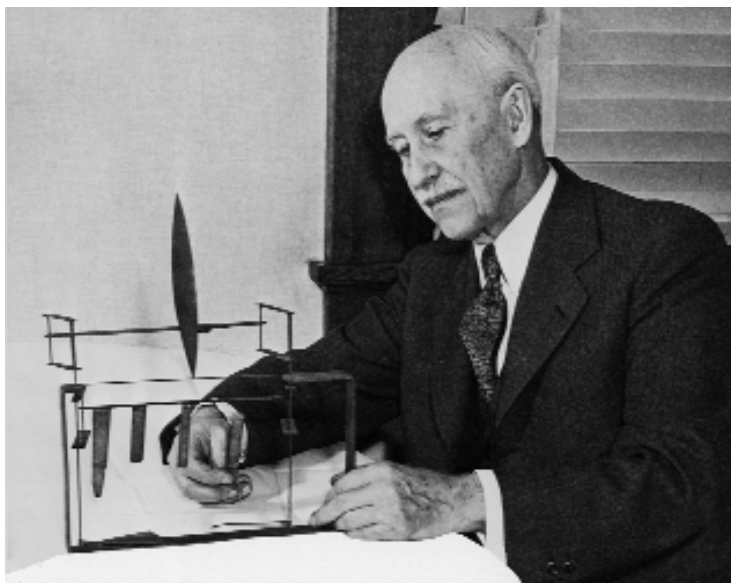
the available information on early attempts to solve the problem of flight. The Smithsonian Institution sent pamphlets and a list of published works on the subject. And so, the Wright brothers' homework began in the summer of 1899. From the resources they reviewed, the Wright brothers detected that previous experimenters failed to give the issue of controlling flying machines serious consideration.

July 1899. Convinced that the concept for controlling a flying machine could be gleaned from how birds used their wings in flight, Wilbur found a solution as he was twisting a rectangular inner-tube box one day at the bicycle shop. Wilbur found the answer in the twisting motion—creating a helical twist instead of treating each wingtip independently. Wilbur constructed a kite using this concept and test flew it in a field near his Dayton home. The kite test was a success, and Wilbur called his theory of control wing-warping.

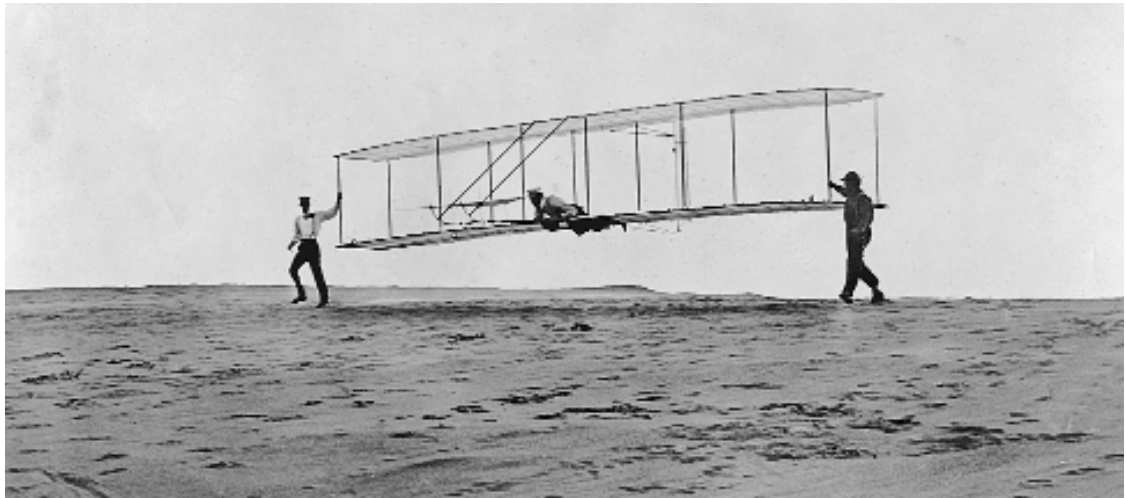
May 13, 1900. After reading Octave Chanute's book, *Progress in Flying Machines*, the Wrights learned much about early aviation research. Wilbur wrote to Chanute and the opening paragraph in his letter was a clue to his determination to solve the problem of flight: "For some years I have been afflicted with the belief that flight is possible to man. My disease has increased in severity and I feel that it will cost me an increased amount of money if not my life."¹ This was the beginning of a correspondence that continued for the next 10 years. Chanute served as a sounding board for the Wright brothers and offered them advice throughout their research and experiments. The relationship between the three would only end when Chanute died in 1910.

September 6–October 23, 1900. The brothers' next step was to construct and fly a full-sized glider to test their theories, such as wing-warping, and their understanding of aerodynamics. Weather conditions around their hometown were not always suitable, so they studied National

Orville Wright with one of the two balances used in the 1901 wind tunnel tests, 1946. Courtesy Carillon Historical Park.



Launching the 1902 glider in Kitty Hawk, North Carolina. Photo courtesy Carillon Historical Park.



Weather Bureau records and chose Kitty Hawk, North Carolina. Here on the lonely sand dunes of Kitty Hawk, the autumn winds blew steadily and long stretches of deep soft sand provided a cushion for hard landings. Much to the wonder of the local residents, these two young men spent the windy fall days of 1900 flying their glider like a kite, learning its ways, and finally, gliding aboard the craft lying prone on the lower wing.

July 7–August 22, 1901. Anxious to begin tests with a larger glider, the Wrights again left Dayton for the Outer Banks of North Carolina. They set up camp near the largest of the Kill Devil Hills. Wilbur made several hundred glides during the 1901 experiments. Using the slopes of Kill Devil Hill and West Hill, he sailed along in winds up to 27 miles per hour, breaking all records for distance in gliding, but the brothers were far from satisfied. They had learned a great deal about control, though their glider was still too feeble while lifting itself off the ground and staying aloft for longer flights. On their way home from Kitty Hawk, Wilbur declared his belief to Orville that not within a thousand years would man ever fly!

October–December 1901. The Wright brothers conducted wind tunnel experiments and determined there was an error in John Smeaton's coefficient used in the calculations for the commonly accepted lift data. Wilbur and Orville conducted meticulous experiments in a wind tunnel they constructed to measure lift and lift-to-drag ratios using balances they made from hacksaw blades.² The brothers used their data to calculate revised lift and drag coefficients. This led to the correction of the universally accepted data that they had used to construct their previous gliders.

August 25–October 28, 1902. With renewed faith in the air pressure tables compiled from their wind tunnel experiments, the brothers returned to Kitty Hawk with a new glider. In this glider the Wright brothers made nearly 1,000 flights. By the end of the 1902 season of experiments, the Wrights had solved two of the major problems of flight: how to properly design wings and control surfaces and how to control a flying machine about its three axes (roll, pitch, and yaw). Most of the battle was now won. The only major problems remaining were incorporating an engine and propellers.

November 1902. After returning home to Dayton, the brothers immediately began searching for an engine manufacturer. The brothers, in characteristic fashion, undertook the project themselves when they could not locate anyone to make an engine to their specifications. Their mechanic, Charlie Taylor, built the engine in the Wright brothers' bicycle shop using the available machinery and tools. In December 1902, the brothers began addressing the construction of propellers. Their research uncovered no theoretical basis for the development of ship propellers that they could apply to airplane propellers, and once again they started at the beginning. After discussions and research, Wilbur and Orville determined a propeller was a rotary wing whose design should be based upon their formulas for lift and drag. The Wright brothers incorporated the engine and propellers made in their bicycle shop into their next machine to attempt free, controlled, and sustained flight in a power-driven, heavier-than-air machine.

March 23, 1903. The brothers filed their first patent application based on their 1902 glider and with no mention of a power plant. After the

U. S. Patent Office rejected the Wrights' patent application twice, the brothers hired patent lawyer Henry Toulmin, who persuaded the brothers to include in their patent application the brothers' three-axis system of control, including wing-warping. The U.S. Patent Office finally granted Patent No. 821,393 on May 22, 1906, to Wilbur and Orville for a flying machine.

September 25–December 17, 1903. When the Wrights arrived at their Kill Devil Hills camp, they first repaired the old living quarters. They also occasionally took their 1902 glider out for flights, and after a few trials both brothers glided for more than a minute and set new world records. After months of delays the 1903 Wright Flyer was ready for flight. Shortly after 10:00 a.m. on the morning of December 17, 1903, the Wright Flyer was moved to a spot on level ground upon the arrival of men from the nearby U.S. Life Saving Station. Orville took the pilot's position; engine and propellers were started. At 10:35 a.m., the machine moved slowly forward under its own power and lifted into the air. The flight covered 120 feet and lasted only 12 seconds. They completed three more flights that day, with the last flight by Wilbur covering 852 feet in 59 seconds.

Wilbur and Orville Wright had solved a mystery that had baffled mankind for centuries. The age of flight had come at last, but only after more than four years of work, four trips to Kitty Hawk, and extensive experiments and research. The Wright brothers' entire inventive process should be commemorated and celebrated as we near the centennial of flight in 2003. The Wright brothers were not just two Daytonians who operated a bicycle shop and happened to fly one day, but dedicated researchers and engineers who focused on a question and followed scientific methods to find the solution.

Notes

- ¹ W. Wright to O. Chanute, May 13, 1900 in Marvin W. McFarland, ed. *The Papers of Wilbur and Orville Wright* (Salem, NH: Ayer Company, Publishers, Inc., 1953) 1:15.
- ² The balances are in the collections of The Franklin Institute, Philadelphia, Pennsylvania.

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From Pasture to Runway

Managing the Huffman Prairie Flying Field

In 1998, Wright-Patterson Air Force Base, in conjunction with Dayton Aviation Heritage National Historical Park, undertook a Cultural Landscape Report for Huffman Prairie Flying Field. The flying field, a national historic landmark within Wright-Patterson Air Force Base, is a partnership unit of the national historical park. Dayton Aviation Heritage historical technician Elizabeth Fraterigo completed a site history, with landscape analysis and evaluation and treatment alternatives currently being determined by this author.

Huffman Prairie Flying Field is the site where Wilbur and Orville Wright mastered the

principles of flight. Following their 1903 first flights at Kitty Hawk, North Carolina, the two brothers returned to their Dayton, Ohio, home and from spring 1904 to fall 1905 continued perfecting their flying technique while developing the world's first practical airplane. Their airfield consisted of an 84-acre pasture owned by the Huffman family; the Wrights gained permission to use the property after promising to coax the horses and cows outside the fence during their flights.¹ In keeping with the belief that property rights extended vertically, they remained within the boundary of the field by flying in circles. By October 5, 1905, Wilbur Wright was able to fly for almost 40 minutes, covering a distance of